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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/541,457	07/06/2005	Hiroshi Sugitatsu	273286US0PCT	8208

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EXAMINER	
MCNELIS, KATHLEEN A	

ART UNIT	PAPER NUMBER
1742	

DATE MAILED: 06/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/541,457	SUGITATSU ET AL.	
	Examiner	Art Unit	
	Kathleen A. McNelis	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 7/6/05.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-7 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-7 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 7/6/2005.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claims Status

Claims 1-7 are presented for examination wherein claims 3, 4, 6 and 7 are amended.

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3, 4 and 7 are rejected under 35 U.S.C. 102(b) as anticipated by Kundrat (U.S. Pat. No. 5,567,224).

With respect to claim 1, Kundrat discloses a method for reducing metal oxide in a rotary hearth furnace wherein a mixture of metal oxide and carbonaceous reducing agent is placed on the upper surface of the hearth and the metal oxide may be chrome ore, chromium ore concentrate or stainless steel flue dust (abstract). Kundrat teaches that the mixture of metal oxide and reductant is placed in a layer upon the hearth and heated to a temperature of at least 1000 °C more preferably at least 1200 °C before a second layer of carbonaceous reductant is placed over the mixture. The reason for heating the mixture first is that the second layer can be insulating, causing ineffectual heating of the mixture in the rotary furnace (col. 4 lines 19-40). Kundrat discloses that the layer of mixture should be no greater than 40 mm and preferably less to minimize the time required for heating the mixture (col. 8 lines 38-65), which examiner contends will result in rapid heating. Kundrat teaches that the heating is by radiation (col. 8 lines 1-26). With respect to claim 3, Kundrat teaches reducing at 1350 °C (col. 6 lines 50-55) which anticipates the claimed range of from 1250 to 1400 °C. With respect to claim 4, Kundrat teaches further melting of the partially reduced chromite ore in a furnace and/or converter (Fig. 1 (16) and/or (18), col. 7 lines 35-40 and examples 1 and 3). With respect to claim 7, carbonaceous powder is charged to the furnace (col. 4 lines 19-40), which examiner contends is a carbonaceous atmosphere-adjusting agent.

Claims 1 and 3-7 are rejected under 35 U.S.C. 102(b) as anticipated by Kikuchi et al. (U.S. Pat. No. 6,592,649).

With respect to claim 1, Kikuchi et al. discloses a method for reducing a mixture of an iron oxide containing raw material with a carbonaceous reducing agent such as coke (abstract) where the iron oxide source material includes chromium oxide in addition to iron oxide (col. 11 lines 34-

53). Kikuchi et al. discloses two heating steps including solid reduction which is done preferably at a temperature of between 1200 to 1400 °C and then the temperature is raised to between 1400 to 1500 °C to melt and coalesce the metallic iron nuggets (col. 7 lines 38-53). The examples teach that a rotary hearth type furnace is charged with about a 20 mm thickness of a mixture of iron ore and carbonaceous reducing agent, then the temperature is rapidly raised to 1100 °C (col. 13 line 42 – col. 14 line 5). With respect to claim 3, example 1 discloses that the reduction step is performed at about 1350 °C (col. 13 lines 1-5), which is within the claimed range of from 1250 to 1400 °C. With respect to claim 4, the reduced mixture is subsequently melted (col. 14 lines 1-10) then cooled and solidified (col. 14 lines 5-17) as in instant claim 5. With respect to claim 6, the temperature for reducing is about 1350 °C which is within the claimed range of from 1250 to 1400 °C, then is raised to about 1400 or 1460 °C for melting (col. 13 lines 1-5) which are within the claimed range of from 1350 to 1700 °C. With respect to claim 7, carbonaceous material is charged as discussed above.

Claims 1 and 7 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ibaraki et al. (U.S. Pat. No. 6,755,888) alone or in view of Takeda et al. (U.S. Pat. No. 6,270,552).

With respect to claim 1, Ibaraki et al. discloses a method of reducing metal oxides in a rotary hearth type furnace (abstract) where a carbon containing powder is mixed with powders of iron and chromium ore as well as waste products from iron and steel production (col. 7 lines 14-30). The mixture is pelletized and fed to a hearth of a rotary hearth furnace where the pellets are spread across the hearth and quickly heated at temperatures of 1100 to 1300 °C where iron reduction reaches 95% or higher and chromium reduction reaches 50% or higher (col. 1 line 59 –

col. 2 line 16). With respect to claim 7, carbon powder is charged to the furnace (col. 7 lines 14-30), which examiner contends is a carbonaceous atmosphere-adjusting agent.

Although Ibaraki et al. does not teach that the heating is by radiation as in instant claim 1, examiner contends that this would be the case in a moving hearth furnace and in the absence of evidence to the contrary.

Alternatively, Ibaraki et al. does not teach that the rapid temperature rise in the mixture is caused by radiation heating.

Takeda et al. discloses a method for reducing a layer consisting of a mixture of oxides such as iron ore and solid reducing material in a rotary traveling hearth and reducing the oxides through radiant heat transfer from above the hearth (abstract). Takeda et al. teaches that in a rotary furnace, the furnace hearth and body are lined with refractory and burner(s) act as a heat source in the upper part of the furnace reducing the solids on the lower hearth portion by radiation heating (col. 1 line 21 – col. 2 line 31). One of ordinary skill in the art would therefore expect at least one heat transfer mechanism in Ibaraki et al. to be radiant heat, since the process is as disclosed by Takeda et al. wherein the heat transfer mechanism is radiant heating.

Claim 2 is rejected under 35 U.S.C. 102(b) as anticipated by Kundrat (U.S. Pat. No. 5,567,224) or Kikuchi et al. or Ibaraki et al. (U.S. Pat. No. 6,755,888) alone or in view of Takeda et al. (U.S. Pat. No. 6,270,552) and further in view of Meissner et al. (5,730,775) and Perry's Chemical Engineers' Handbook.

Kundrat or Kikuchi et al. or Ibaraki et al. alone or in view of Takeda et al. is applied as discussed above regarding claim 1.

Kundrat or Kikuchi et al. or Ibaraki et al. alone or in view of Takeda et al. does not disclose that the average rate of raising the temperature of the mixture in the reducing step is 13.6 °C/min or higher from the initiation of the radiation until the mixture reaches 1,114 °C.

Meissner et al. discloses a method for producing direct reduced iron from dry compacts of iron oxide and carbonaceous material (abstract). Compacts are exposed to a radiant heat source in a rotary hearth furnace preheating zone (col. 1 lines 10-15). Results presented by Meissner et al. demonstrate that the higher the temperature of the radiant heat source, the faster the compacts reach metallization goals (col. 5 lines 1-13). While Meissner et al. does not equate the higher temperature with increased heating rate, one of ordinary skill in the art would recognize that the rate of radiant heat transfer in a furnace is strongly affected by temperature (T^4) as taught by Perry's Chemical Engineer's Handbook (p. 5-23 to 5-32). Meissner et al. therefore demonstrates that the temperature of the radiant heat transfer source is a result effective variable which is varied to affect the time required to achieve metallization goals and Perry's Chemical Engineer's Handbook teaches that increasing the temperature of the radiant heat source increases the heating rate as a function of T^4. It would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the radiant heat source temperature as a result-effective variable in the process of Kundrat or Kikuchi et al. or Ibaraki et al. alone or in view of Takeda et al., therefore adjusting the rate of heating to affect the time required to achieve metallization goals as taught by Meissner et al. (see M.P.E.P 2144.05, II, B).

Claim 3 is rejected under 35 U.S.C. 103(a) as obvious over Ibaraki et al. (U.S. Pat. No. 6,755,888) alone or in view of Takeda et al. (U.S. Pat. No. 6,270,552).

Ibaraki et al. alone or in view of Takeda et al. is applied as discussed above regarding claim 1. Further, Ibaraki et al. discloses reducing the compacts at temperatures of 1200 °C or

higher (col. 18 lines 1-11). The range of 1200 °C or higher overlaps the claimed range of from 1250 to 1400 °C. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select a range of 1250 to 1400 °C since Ibaraki et al. discloses equal utility for the range of 1200 °C or higher.

Claims 4-6 are rejected under 35 U.S.C. 103(a) as obvious over Ibaraki et al. (U.S. Pat. No. 6,755,888) in view of Takeda et al. (U.S. Pat. No. 6,270,552).

Ibaraki et al. in view of Takeda et al. is applied as discussed above regarding claim 1.

Ibaraki et al. discloses that melting will occur at elevated operating temperatures or carbon content, and teaches against melting in a conventional rotary hearth reducing furnace due to potential damage to the hearth (col. 12 lines 26-38). Ibaraki et al. therefore does not teach that the mixture is successively melted (claim 4) in the moving hearth (claim 5) at a temperature of from 1350 to 1700 °C (claim 6).

With respect to claims 4 and 5, Takeda et al. discloses an improvement to traveling hearth furnaces wherein ore oxides are reduced through radiant heat transfer from the furnace hearth then melted to separate the slag from the reduction product followed by solidification of the reduced material (abstract). The traveling hearth furnace has a reduction zone, melting zone and cooling zone (col. 7 lines 1-20). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the improved moving hearth furnace of Takeda et al. with the process of Ibaraki et al. to allow melting and separation of reduced product from slag as taught by Takeda et al.

With respect to claim 6, Ibaraki et al. discloses reducing the compacts at temperatures of 1200 °C or higher as discussed above regarding claim 3 and Takeda et al. discloses further melting at a temperature of over 1450 °C (col. 3 lines 50- 65) and provides data of slag separation as a function

of temperature up to about 1650 °C (Fig. 3). The range of between 1450 °C and 1650 °C is within the disclosed range of 1350 °C to 1700 °C.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kathleen A. McNelis whose telephone number is 571 272 3554. The examiner can normally be reached on M-F 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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